بسم الله الرحمن الرحيم

Sight Distance

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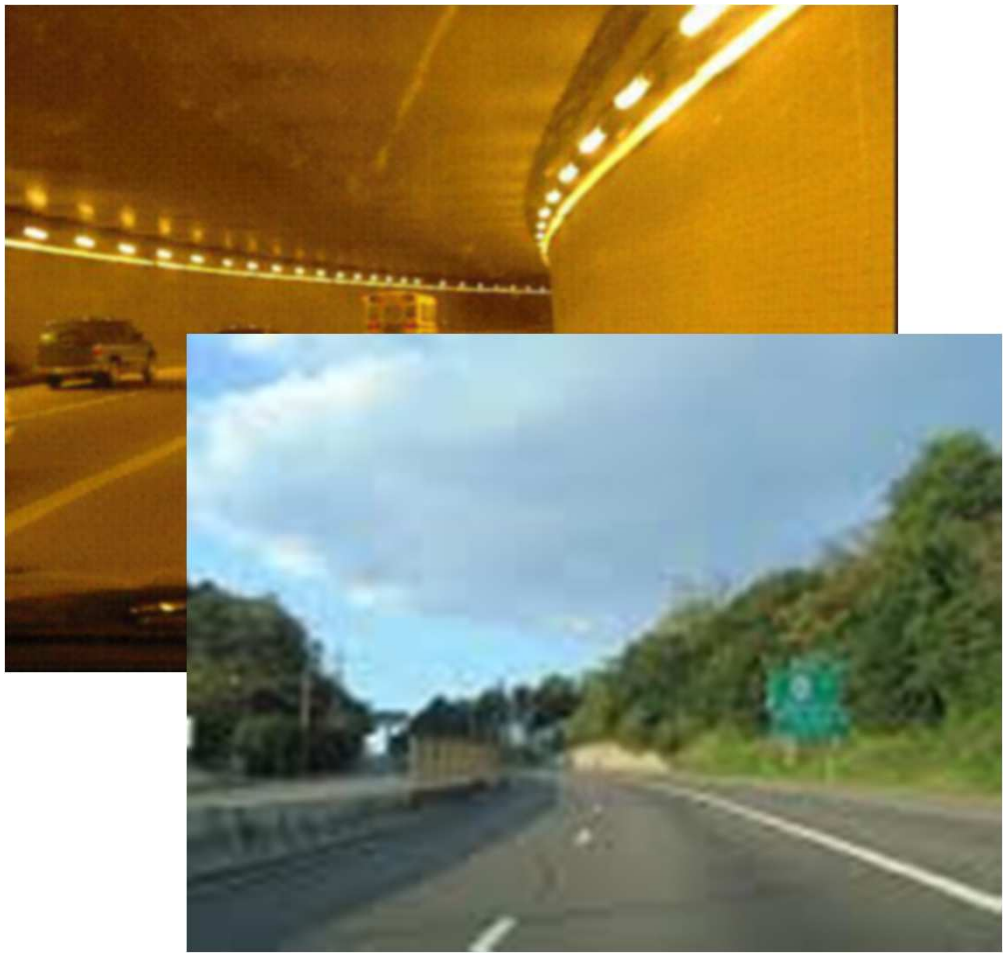
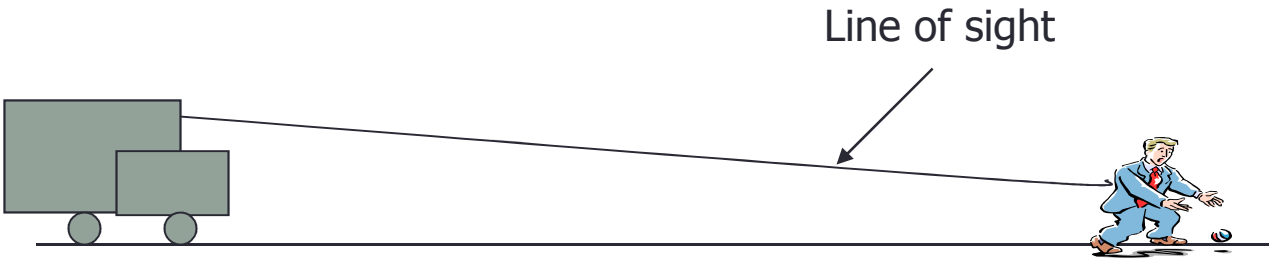
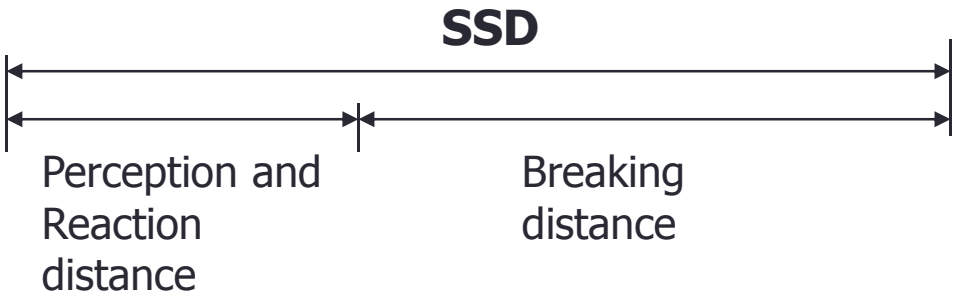
Sight Distance

- Is the length of highway a head which is visible to the driver.
- Three basic types of sight distances:
  1- Stopping sight distance (SSD)
  2- Decision sight distance (DSD)
  3- Passing sight distance (PSD)



Stopping Sight Distance (SSD)





$$SSD = 0.278Vt + \frac{V_i^2 - V_f^2}{255\,(f \pm g)}$$

Where:

V : is the speed

T : is perception and reaction time almost 2.5 sec

F : is coefficient of long. Friction depend on (V)

G: grade in decimal number

Relation between design speed and friction coefficient

Design Speed (V)	Friction Coefficient (F)
40	0.38
50	0.36
60	0.34
70	0.32
80	0.31
90	0.30
100	0.30
110	0.29
120	0.28
130	0.27
140	0.27

Examples

Ex1: Calculate the stopping sight distance required for a driver travels at 80kph. If the pavement becomes wet so that the longitudinal friction is reduced by 0.12 what will be the SSD. Comment the results.

$$SSD = 0.278Vt + \frac{V_i^2 - V_f^2}{255\,(f \pm g)}$$

SSD1= $0.278(2.5)(80) + (80)^2/255(0.31+0) = 136.5$ m

SSD2= $0.278(2.5)(80) + (80)^2/255(0.19+0) = 187.7$ m

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Ex2: A driver require 95 m to stop his vehicle on certain highway section of grade +4%. Calculate the safe traveling speed on his highway section. If the driver travels with resulting safe speed on another HWY section with downgrade –4%. What will be the SSD.

Assume f= 0.3

Braking distance= $\frac{V_i^2 - V_f^2}{255\,(f \pm g)}$

$95 = V^2 / 255\,(.3+0.04)$, V = 90.8 kph, Max.safe speed is 90kph

In case of downgrade

SSD = $0.278(2.5)(90) + (90)^2/ 255(0.3 - 0.04) = 185$ m

Decision Sight Distance (DSD)

Is defined as the distance required for a driver to detect an unexpected or otherwise difficult to perceive information source or hazard in a roadway environment, …….

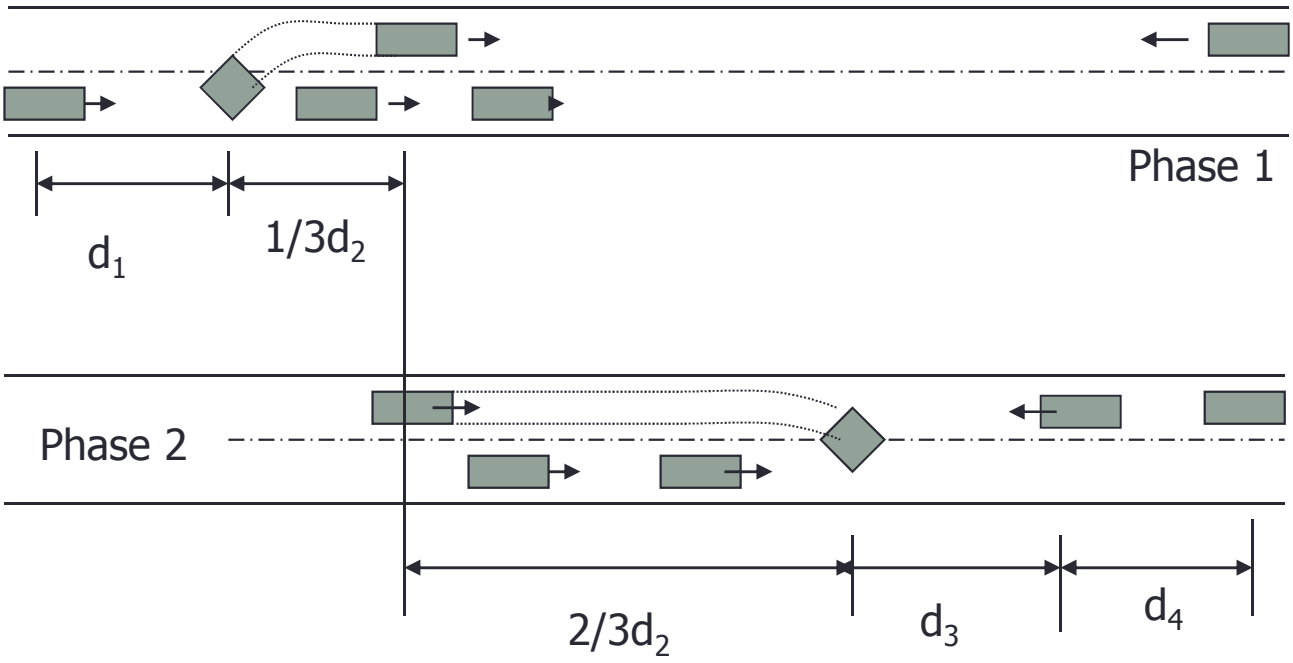
It is desirable to provide the **DSD** include: Change in cross section, Areas of concentrated traffic demand, locations where unusual or unexpected maneuvers are required, and Intersections and interchanges.

$$DSD = 0.278\ V\ t$$

Where: V : is the design speed, t : is total time

Design speed kph	Time (s)			
	Detection time	Decision time	Maneuver time	Summation of time
50	1.5-3.0	4.2-6.5	4.5	10.2-14.0
60	1.5-3.0	4.2-6.5	4.5	10.2-14.0
70	1.5-3.0	4.2-6.5	4.5	10.2-14.0
80	1.5-3.0	4.2-6.5	4.5	10.2-14.0
90	1.5-3.0	4.2-6.5	4.5	10.2-14.0
100	2.0-3.0	4.7-7.0	4.5	11.2-14.5
110	2.0-3.0	4.7-7.0	4.0	10.7-14.0

Passing Sight Distance (PSD)



PSD = $d_1 + d_2 + d_3 + d_4$

Passing Sight Distance (PSD)

Is the sight distance that achieve a safe passing maneuvers on two-lane, two-way highways. To achieve a safe passing maneuvers, the driver of the passing vehicle must see enough of the highway clear of opposing traffic to permit him to complete the passing maneuver and return to the right lane before meeting opposing traffic.

$$\mathbf{PSD = d_1 + d_2 + d_3 + d_4}$$

Where: d_1: is the distance traveled during perception and reaction time and during acceleration.

$$d_1 = 0.278\ t_1\ (v - m + a t_1/2)$$

d_2: is distance traveled during the time the passing vehicle is traveling on the left lane.

$$d_2 = 0.278\ v\ t_2$$

d_3: is the distance between the passing vehicle at the end of its maneuver and the opposing vehicle.

$$d_3 = 30 - 90\ m$$

d_4: is the distance moved by the opposing vehicle during 2/3 of the time the passing vehicle is on left lane.

$$d_4 = 2/3\ d_2$$

(PSD) on 2-lane, 2- way highways,whereas,(SSD) on all types of highways

Examples

EX: Compute the minimum PSD required for highway section with the following information:

-Average speed of slow vehicle = 70 kph

-Average speed of passing vehicle = 80 kph

- Average acceleration rate = 3kph / sec

- Preliminary delay time = 3.5 sec

- Left lane occupancy time = 8.0 sec

Solution

$d_1 = 0.278\ t_1\ (v-m+at_1/2)$

$m = 80 - 70 = 10$ kph

$d_1 = 0.278\ (3.5)\ (80-10+ 3*3.5/2) = 73.22$ m

$d_2 = 0.278\ v\ t_2 = 0.278\ (80)(8) = 177.92$ m

$d_3 = 30 - 90$ m, take $d_3 = 90$ m

$d_4 = 2/3\ d_2 = 2/3\ (177.92) = 118.61$ m

PSD = 73.22+ 177.92 + 90 + 118.61 = 459.76 m